

able before dogmatising on this difficult question, in view of the limited nature of human experience. In the first two parts of the book the author deals with heat in bodies, and afterwards also with radiant heat. The third part is concerned with the classical laws of radiation and the last part contains a valuable account of Planck's own work on the theory of quanta as applied to the energy distribution in the normal spectrum, and the equation of state of material bodies.

These volumes should take their place in the library of every physicist. H. S. ALLEN.

Antarctica

The Conquest of the South Pole: Antarctic Exploration 1906-1931. By J. Gordon Hayes. Pp. 318 + 24 plates. (London: Thornton Butterworth, Ltd., 1932.) 18s. net.

DR. H. R. MILL'S "Siege of the South Pole" was published in 1905. It was a scholarly book, full of the author's enthusiasm for the explorers and their work, and with just sufficient of the popular to recommend it to the general as well as to the informed reader. Many regard it as the best book on the Antarctic, and it is certainly among the first half-dozen, occupying an honoured place with the travel narratives themselves; with Scott's "Voyage of the Discovery", Shackleton's "Heart of the Antarctic", and Shackleton's "South".

Dr. Mill's book ended with the period of the British Antarctic Expedition, led by Capt. Scott in the *Discovery* in 1901-4. Fresh expeditions from that date have followed one another in rapid succession, and in 1911, for example, there were as many as seven separate parties in the field belonging to five expeditions. As Dr. Mill says in his introduction to Mr. Hayes' book, he was soon bombarded by demands for a continuation; and he made up his mind to rewrite and modernise the "Siege". Other factors however intervened, and perhaps providentially. It is doubtful if a sequel or a revision can ever repeat a first success. Dr. Mill in the end had to give up the idea either of rewriting the "Siege" or publishing a fresh book to deal with the last twenty-five years. Concurrently, however, he had found Mr. Gordon Hayes more than willing to undertake the work and anxious also to be guided by his predecessor. The present book is the result, written by Hayes and approved by Mill.

The expeditions dealt with begin with Shackle-

ton's journey to the plateau in 1909, when he out-distanced his predecessors by more than 400 statute miles. Hayes, like Mill, is carried away with enthusiasm. Charcot, Amundsen, Mawson and Scott take their place among his heroes; and if Amundsen, the conqueror of the South Pole, gets less space than the others, it is a tribute probably to the speed of his dash south and to the efficiency of his plans. In the author's opinion the heroic age ends with the adventures of the *Endurance*, when the ship was lost, but Shackleton brought his party back intact.

For the later expeditions, Mr. Hayes prefers the adjective mechanic rather than homeric, but not to the exclusion of heroism. Wilkins, Riiser-Larsen, and Byrd are all flying men, and they have all of them shown how discoveries are now dominated by the machine. There is a limit, however, to the effectiveness of the aeroplane, as exploration, in its widest sense as distinct from discovery, must still be done on the ground. This is driven home both by Hayes and by Mill; the aeroplane may be the eyes of the Antarctic leader; to explore and to conquer is still the work of the man on the ground. The motor sledge will be his ultimate standby; but meantime dogs and men may still make records in the Antarctic. J. M. WORDIE.

Structure of Crystals

The Structure of Crystals. By Ralph W. G. Wyckoff. (American Chemical Society Monograph Series, No. 19.) Second edition. Pp. 497. (New York: The Chemical Catalog Co., Inc., 1931.) 7.50 dollars.

DR. WYCKOFF'S monograph on "The Structure of Crystals" has, in the second edition, been revised so drastically that it is in effect a new book, since, although the experience gained from the first edition has not been lost and many of the figures have been retained, the original text has been sacrificed almost in its entirety. A most praiseworthy sequel is that the main text is actually shorter by 27 pages, but the bibliography, which began with 7 entries for 1912 and included 112 entries for the year 1922, has now expanded to 367 entries for 1930 and occupies altogether nearly eighty pages in the new edition.

The principal additions include an introductory chapter, which makes it easier to start reading the book, and new sections on the production of X-rays, the scattering power of atoms, atomic